The Mahlon F. Easterling Collection, 1959-1994
1.5 cubic feet
JPL 109

Biography

Mahlon Easterling received a BS degree in 1949 and an MS degree in 1951, both at Columbia University in the subject of Electrical Engineering. After graduating, Easterling remained at Columbia for three years, first as a member of the Scientific Staff and then as Assistant Professor. In addition to his teaching duties, he worked at the Electronics Research Laboratory on the development of a computing auxiliary to a search radar for the direction of interceptor aircraft. In 1954 he joined the Schlumberger Oil Well Surveying Corp. of Houston, Texas, and worked on instrument development for downhole geophysical studies until 1958, when he joined the Jet Propulsion Laboratory (JPL). During the 1960s, Easterling was a Senior Project Engineer in the Telecommunications Division at JPL. In the early 1970s, Easterling was manager of Section 410, Tracking and Data Acquisition (TDA) Planning.

In 1971, Easterling was a charter member of the Environmental Quality Laboratory (EQL) organized at California Institute of Technology (Caltech). EQL brought together representatives from JPL, Caltech and the Rand Corporation to consider the broad implications of environmental problems and translate their findings into possible political, economic and social solutions. EQL's initial focus was on the reduction of automobile emissions.

Easterling retired from JPL in 1979, but returned for a few years as a consultant. During the mid 1980s, Easterling taught an intensive course at the School of Forestry at Duke University on the application of Dynamic Modeling to Forest Management.

Easterling was honored as winner of NASA's Exceptional Service Medal in 1977, for the use of coded microwave signals bounced off the surface of the Moon, to make possible synchronized timing of all the Deep Space Network Stations. The process was developed by Easterling, and has been in use since 1967. Easterling was also recognized in 1979 with NASA's Outstanding Leadership Medal. He was also recognized by NASA with several Certificates of Recognition for his patents.

Provenance

The collection was compiled by Mahlon Easterling of JPL Section 410, Tracking and Data Acquisition Planning. It was transferred to the JPL Archives on August 8, 1999 by Easterling's wife, Muriel Easterling.

Collection Arrangement and Description

The collection is arranged into six series, Publications written by Easterling (in Boxes 1-3), Publications written by others (in Box 3), Patent Information (in Box 4), Correspondence (in Box 4), EQL Materials (in Box 5), and Miscellaneous (in Box 5). Included in the collection are publications, correspondence, memoranda, reports, patents, photographs, agendas, meeting announcements, and one simple Schmitt Trigger digital module assembly, complete with plans, bus, transistor, resistor and capacitor units.

Represented in the Publications by Easterling is an article written by Easterling and Richard Goldstein refuting claims that the use of the S-band would not work for interplanetary spacecraft communications. Also documented are the notes of a 1967 presentation laying out Easterling's theory of synchronizing timing of all Deep Space Network Stations by the use of microwave signals being bounced off the surface of the Moon, an idea he was later awarded for. Publications before 1970 almost all deal with telemetry, telecommunications or tracking and data acquisition. Also represented are publications Easterling authored for EQL between 1970-1973. These have been retained in this series rather than the EQL series to maintain a unified cohesion of Easterling published materials.

Publications by others are copies of documents written by friends or associates of Easterling, or deal with subjects Easterling was interested in. Of note is a short article written by Timothy Ferris on JPL, the

Voyager mission, and the Deep Space Network (DSN), featuring comments by Easterling, among others. There is also an overview of deep space communication by Edward C. Posner and Robertson Stevens.

Information regarding Easterling's patents is in the Patent Information series. The files contain correspondence, reports, memoranda, and a copy of the patents themselves. Documented in the collection are seven patents that Easterling earned, either by himself or shared with others.

The Miscellaneous Correspondence series is a small series of four folders, filed alphabetically by subject name. The series primarily consists of correspondence written by and to Easterling after his retirement.

The EQL Materials series includes documents published by EQL, excluding articles written by Easterling himself. Also represented are press releases and newspaper clippings documenting the actions of EQL in the early 1970s, and a folder of correspondence documenting Easterling's public speaking efforts for EQL.

The Miscellaneous series contains folders too small to consitiute an entire series on their own. Included is a folder documenting awards that Easterling received, including the Exceptional Service Medal in 1977, and photographs of Easterling being presented awards by JPL Director Bruce Murray and NASA Administrator Robert A. Frosch. A Certificate of Appreciation from the American Astronomical Society Division of Planetary Sciences to the Deep Space Network, awarded in 1994, is also included. Also included in the series are documents and photographs about the "Unified S Band," a three-man band comprised of Easterling, Douglas Mudgway and Robert Stevens, fellow DSN employees. There is one folder containing the Schmitt Trigger digital module assembly, with plans, bus, transistor, resistor and capacitor units.

Conservation/Preservation

Standard preparations of documents for long term storage were completed. A re-bagging of the Schmitt Trigger assembly was completed.

Separation Statement

No items were separated from the collection.

Finding Aids

No other finding aids exist for the collection.

FILE FOLDER LIST

Box 1 of 5 - Publications written by Easterling

Fld. 1 D. W. Drogosz, M. F. Easterling, F. J. Kollar, "Microcomputer Based Alternate Data Source for Real-Time Spacecraft Data Display," n.d.

Fld. 2 Ranging Subsystem Mk. 1 - Logic Sheets ["Six Applications of Dynamic Logic"], n.d.

Fld. 3 S. W. Golomb, M. Easterling, J. Stiffler, *Section Report No. 331-1: Investigation of Acquirable Ranging Codes*, September 30, 1960. [bound]

Fld. 4 "A Pseudo-Random Coded Ranging System," October 26, 1960.

Fld. 5 "Preliminary Analysis of Ranging System Modulation," December 20, 1960.

Fld. 6 "Notes on a Proposed New Method for Correlating a Ranging Code," December 22, 1960.

Fld. 7 Leonard Baumert, Mahlon Easterling, Solomon W. Golomb, Andrew Viterbi, *Technical Report No. 32-67: Coding Theory and Its Applications to Communications Systems*, March 31, 1961.

[bound]

Fld. 8 "A Long-Range Precision Ranging System," URSI [International Scientific Union], May 4, 1961.

Fld. 9 "Amplitude-Modulated Range-Measuring System," in *Technical Report No. 32-132: Radar Exploration of Venus: Goldstone Observatory Report for March-May 1961*, ed. W. K. Victor, R. Stevens, S. W. Golomb, August 1, 1961. [bound]

Fld. 10 Eberhardt Rechtin, Solomon W. Golomb, Mahlon Easterling, *Technical Memorandum No. 33-13: JPL Range and Doppler System*, September 22, 1961 [bound]

Fld. 11 "Analysis of the Effect of a Limiter on a Square Wave Signal Plus Additive Gausian Noise," February 27, 1962.

Fld. 12 "Correlation Properties of Acquirable Ranging Codes," URSI paper, May 1, 1962.

Fld. 13 "A Skin Tracking Radar Experiment Involving the Courier Satellite," *IRE Transactions on Space Electronics and Telemetry*, June 1962, and *JPL Technical Report No. 32-298*, June 1962.

Fld. 14 "The Nature of the JPL Range Measurement," October 8, 1963.

Fld. 15 "Methods for Obtaining Velocity and Range Information from CW Radars," Eighth AGARD (NATO Advisory Group for Aeronautical Research and Development) Avionics Panel, London, England, Sept. 21-25, 1964.

Fld. 16 "Amplitude-Modulated Range-Modulated System," and "Closed-Loop Ranging Data," in *Technical Report No. 32-396: Radar Exploration of Venus: Goldstone Observatory Report for October-December 1962*, ed. R. Goldstein, R. Stevens, W. K. Victor, March 1, 1965. [bound]

Box 2 of 5

Fld. 17 M. Easterling, J. L. Adams, A. C. Knoell, D. R. Margetts, "Memorandum Report: Touchdown Telemetry System," May 13, 1965.

Fld. 18 "The Effect of the Interplanetary Medium on S-Band Telecommunications," Tenth AGARD Avionics Panel, Rome, Italy, Sept. 21-25, 1965.

Fld. 19 "Timing for Processing Satellite Communications Systems," IDA (Institute for Defense Analysis) Summer Study, July 5-29, 1966. (note: contains classified material later downgraded.)

Fld. 20 Mahlon Easterling and Richard Goldstein, "The Interplanetary Medium and S-Band Telecommunications," *Astronautics & Aeronautics*, August 1966.

Fld. 21 Mahlon Easterling and W. S. Baungartner, "A World-Wide Lunar Radar Time Synchronization System," AGARD Advanced Navigational Technique symposium, Milan, Sept. 12-15, 1967 (1965-1967)

Fld. 22 "The Grand Station Design for Deep Space Communications," IEEE International Conference on Communications, Philadelphia, June 12, 1968.

Fld. 23 "Tracking and Ranging," [lecture given while a guest lecturer, UCLA short course "Recent Advances in Space Communications," July 10, 1968.

Fld. 24 Robert C. Tausworthe, A. J. Spear, Mahlon Easterling, "A High-Rate

Telemetry System for the Mariner Mars 1969 Mission," August 1968 and *JPL Technical Report 32-1354*, April 1, 1969.

Fld. 25 Caltech seminar transparencies, October 1969.

Fld. 26 "Proposed Experiment for Engineering 5- Linear Shift Register Sequences," November 1969.

Fld. 27 "The Mariner Series of Spacecraft," NSF Presentation, and related information/publications, Jan. 13-14, 1970.

Fld. 28 "Efficiency in Coded Communications Systems," NASA Coded Communications Conference, Feb. 26, 1970.

Fld. 29 "Future Possibilities in Spacecraft Ranging and Doppler Systems," Conference on Experimental Tests of Gravitation Theories, California Institute of Technology, Nov. 11-13, 1970.

Fld. 30 "The 1970 Clean Air Car Race- Purpose and Results," Engineers Week, Feb. 23, 1971.

Fld. 31 Peter Borelli, Lester Lees, Mahlon Easterling, Guy Parker, Burton H. Klein, Robert Poppe, *People, Power and Pollution: Environmental and Public Interest Aspects of Electric Power Plant Siting*, September 1, 1971.

Fld. 32 *Report from Energy Conservation and Management Project*, December 19, 1972.

Fld. 33 M. F. Easterling, W. S. Baumgartner, W. E. Larkin, "A Note on the Reception of a Certain Kind of Telemetry Signal," April 24, 1973.

Box 3 of 5

Fld. 34 "The Role of Periodic Motor Vehicle Inspection in Air Pollution Abatement," January 1973.

Fld. 35 "Periodic Motor Vehicle Inspection as a Smog Abatement Measure in the South Coast Air Basin," January 1973.

Fld. 36 "The Role of Periodic Motor Vehicle Inspection in Air Pollution Abatement," Transportation Research Board, July 1974. [re-write of earlier paper, see Folder 34.]

Fld. 37 *Alternate Data Source*, 1976.

Fld. 38 "From 8 1/3 Bits Per Second to 100,000 Bits Per Second in Ten Years," National Telecommunications Conference, Dallas, Nov. 29-30, Dec. 1, 1976; and *IEEE Communications Society Magazine*, Nov. 1977. 1976-1977.

Fld. 39 "Large Antennas in Space," Space Technology Seminar, Dec. 17-19, 1976.

Fld. 40 *890-126: A Series of Memoranda on Future Plateaus of Capability in the DSN*, June 15, 1981.

Fld. 41 "A Long-Range Precision Ranging Station," in folder titled "JPL Ranging References," n.d. (Folder 1 of 2)

Fld. 42 (Folder 2 of 2)

<u>Publications Written by Others</u>

Fld. 43 Collection of Mathematical Papers, written by L. D. Beaumont, Robert C. Titsworth, n.d.

Fld. 44 Solomon W. Golomb, *University of Southern California School of Engineering Technical Report: The Shift Register as a Finite State Machine*, December 1964.

Fld. 45 A. M. Turing, "On Computable Numbers, With an Application to the

Entscheidungsproblem," *London Mathematical Society*, 1936; JPL Interlibrary Loan Request dated Dec. 3, 1969.

Fld. 46 Wayne Boucher, "Futures Research," April 24, 1978.

Fld. 47 Timothy Ferris, "Navigators Who Probe the Mysteries of Deep Space," *New York Times Magazine*, April 1, 1979; reprinted in *JPL News Clips*, April 10, 1979.

Fld. 48 Edward C. Posner, Robertson Stevens, "Deep Space Communication-Past, Present, and Future," reprinted from *IEEE Communication Magazine*, May 1984.

Fld. 49 "Final Report of the Phase I TDA System Engineering Study Team," January 20, 1987.

Fld. 50 "Fuzzy Logic," newspaper and magazine articles, 1988-1990.

Box 4 of 5 - Patent Information

Fld. 51 Apparatus for Investigating Earth Formations, 1959-1962.

Fld. 52 Radar Ranging Receiver, 1962-1965.

Fld. 53 Phase-Locked Loop with Sideband Rejecting Properties, Donald W. Brown, Mahlon Easterling, Warren L. Martin, Edward C. Posner, 1963-1967.

Fld. 54 Time Synchronization System Utilizing Moon Reflected Coded Signals, 1965-1969.

Fld. 55 Two Carrier Communication System with Single Transmitter, 1969-1973.

Fld. 56 Radio Frequency Arraying Method for Receivers, Milton H. Brockman, Mahlon F. Easterling, 1977-1980.

Fld. 57 Baseband Signal Combiner for Large Aperture Antenna Array, Mahlon F. Easterling, Robin A. Winkelstein, 1978-1981.

Miscellaneous Correspondence

Fld. 58 Murray, Bruce, 1978-1983.

Fld. 59 Pickering, William H., 1987.

Fld. 60 Rechtin, Ebhardt, 1988.

Fld. 61 Victor, Walt, 1988.

Box 5 of 5 - Environmental Quality Laboratory (EQL) Materials

Fld. 62 Caltech Fleet Conversion, Dec. 1, 1970.

Fld. 63 EQL News Releases/ Clippings, 1971.

Fld. 64 Easterling talks while at EQL, 1971-1972.

Fld. 65 *Caltech Clean Air Project Gaseous Fuels Manual*, Nov. 1, 1971

Fld. 66 *EQL Report #4: Smog: A Report to the People of the South Coast Air Basin*, January 15, 1972.

Fld. 67 *Energy as a Scarce Resource*, Dec. 9, 1972.

Fld. 68 *Final Report to the Rockefeller Foundation: The Caltech Clean Air Project*, July 1973.

Fld. 69 *Highways and Air Quality*, Sept. 1973.

Miscellaneous

Fld. 70 Awards and Letters of Appreciation, 1974-1994.

Fld. 71 "Unified S Band," Easterling, Douglas Mudgway, Robert Stevens, 1987.

Fld. 72 Digital Module Assembly, Schmitt Trigger [blueprint and parts], n.d.

CATALOG DESCRIPTION

Mahlon F. Easterling Collection, 1959-1994.

1.5 cu. ft. (5 boxes)

The collection documents the professional career of Mahlon F. Easterling, manager of the Jet Propulsion Laboratory's Section 410, Tracking and Data Acquisition (TDA) Planning. The collection includes publications, correspondence, memoranda, reports, patents, photographs, agendas, meeting announcements.

During the early 1970s, Easterling was a charter member of the Environmental Quality Laboratory (EQL) organized at California Institute of Technology (Caltech). He authored or co-authored several patents, and he was honored as winner of NASA's Exceptional Service Medal in 1977, and NASA's Outstanding Leadership Medal in 1979.

Register available in the repository.

Tracings

Easterling, Mahlon
Rechtin, Eberhardt
Goldstein, Richard
Posner, Edward C.
Golomb, Solomon W.
Victor, Walter K.
Murray, Bruce
Pickering, William H.
Lees, Lester
Jet Propulsion Laboratory - History
Environmental Quality Laboratory
Tracking and Data Acquisition
Lunar Radar Time Synchronization System
Deep Space Network - History

Accession 99-18.